

**MOTOR PUMP WITH AXIAL THROUGH FLOW COMPRISING AN
INCORPORATED FLOWMETER AND PRESSURE CONTROLLER**

[Signature]
[0001] The present invention relates to an axial through flow motor pump with an incorporated flowmeter and pressure controller.

[0002] It is particularly adapted to equip automatic coffee machines, but it can be used for numerous other applications requiring pressurized liquid supply from a reservoir.

[0003] The French Patent No. FR 98 06 431 filed by the Applicant of the present invention describes a coffee machine comprising a motor pump associated with a pressure controller mounted on the supply circuit and making it possible not only to control the water supply system, but also to remove the reservoir to fill it up due to the fact that said pressure controller is constituted of two elements that can be coupled, one of which is fixed on the frame of the machine and the other to the base of the reservoir, each of these two elements being automatically sealed when they are separated.

[0004] The fixed element is connected to the motor pump and is equipped with a flexible membrane acting on an electric contact as a function of the variations in pressure generated by the modifications of the water level in the reservoir. The liquid that penetrates into this element converges to a single chamber in which the flexible membrane and the outlet orifice toward the motor pump are located. Under certain conditions, this arrangement causes an aberrant functioning of the electric contact, in particular during stops and starts of the motor pump.

[0005] The object of the device according to the present invention is to obtain a motor pump incorporating the assembly of the devices for controlling the liquid flow and connected to a particularly reliable supply pressure controller.

[0006] It is constituted of an internal axial flow motor pump, with an electromagnetic motor and a hollow free piston, equipped with an incorporated flowmeter and flow limiting device, and associated with a pressure controller adapted to control its supply and comprising separate internal passages for the liquid flow converging to the motor

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pump and for connecting to a chamber containing a flexible membrane actuating an electric contact for controlling the motor pump power supply.

[0007] In the annexed drawings, provided by way of a non-limiting example of one of the embodiments of the object of the invention:

[0008] Figure 1 is an axial cross-section of the motor pump having an incorporated flowmeter and pressure limiting device,

[0009] Figure 2 is a transverse cross-section along the arrows F1 of Figure 1,

[0010] Figure 3 is an enlarged front view of the bucket wheel of the flowmeter,

[0011] Figure 4 is an axial cross-section along the arrows F2 of Figure 3,

[0012] Figures 5 and 6 are axial cross-sections of the two separated elements of the pressure controller, and

[0013] Figure 7 shows these two elements as assembled, under the same conditions, at a different scale.

[0014] The device, Figures 1-4, is constituted of a liquid supply motor pump 1 consisting of an integral assembly comprising an incorporated flowmeter 2 and pressure limiting device 3. Preferably, it is of the type having a hollow piston with an electromagnetic motor, but it can also be of the type having a controlled piston driven by a rotary engine. In the first case, it is advantageously constituted of a main body 4, machined in a single piece made of plastic, one of its ends forming the coil 5 of the electromagnetic motor, the other end containing the cylinder block 6 in which the piston 7 moves, and comprising non-return valves 8 and 9.

[0015] The flow meter 2, located in a block closing the main body 4 on the side opposite the cylinder block 6, immediately after the water inlet 10 (Figure 2), is formed of a free bucket wheel 11 and comprises one or several permanent magnets 12 whose passage

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is detected by an electromagnetic detector 13, having a double function of allowing to stop the motor pump once the desired quantity of water has been obtained, and of signaling a possible flaw in the water inlet.

[0016] The pressure limiting device 3 is constituted of a bore provided in the cylinder block 6 containing a calibrated spring-loaded valve connecting the water outlet 14 to the base of the piston 7, such that water is recycled, without driving the flow meter 2 in the case of back pressure at said water outlet.

[0017] The arrangement of the water inlet 10 and of the flow meter 2 opposite the water outlet 14 causes the passage of water through the motive portion of the pump, along the axis of the latter, which makes it possible to have a direct flow substantially improving the functioning and reliability of the pump as shown by the tests.

[0018] The motor pump 1 is advantageously associated with a pressure controller 20 mounted on the liquid supply circuit (Figures 5-7).

[0019] This pressure controller is constituted of a fixed element 21, affixed to the motor pump 1 or to the frame carrying the latter, and of an end piece 22 mounted at the base of the reservoir 23 and connected to it. These two elements constituting a quick connection can be separated so as to render the reservoir detachable without any tool.

[0020] The fixed element 21 comprises an electric contact 24 formed of two electrodes and of a flexible membrane carrying a conducting plate that is normally moved away from these electrodes by an elastic device, and establishing the contact with one another when the weight of the liquid present in the reservoir 23 pushes back the flexible membrane, the decrease in pressure caused by the level drop in the reservoir having the opposite effect by moving the membrane and the conducting plate away from the electrodes, which cuts off the contact. This device constitutes a very reliable means for controlling the automatic supply systems of the machine.

[0021] To avoid the repercussions of the variations in pressure caused by the starts and stops of the motor pump 1 on the membrane of the contact 24, the flow of the liquid

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penetrating in the pressure controller 20 is divided into two portions directed toward the chamber 25 containing the flexible membrane of the contact 24 and toward the outlet orifice 26 of the pressure controller, respectively. This is obtained due to two passages: a central passage 27 leading to the chamber 25, on the one hand, and a peripheral passage 28 leading to the outlet orifice 26, on the other hand. These two passages are separated by a hollow piece 29 arranged in the body 30 of the fixed element 21 and extended by a bush 31 located in the end piece 22.

[0022] The bush 31 is axially movable and is associated with a spring so as to close the peripheral passage 28 during the separation of the fixed element 21 and of the end piece 22, the central passage 27 being closed by a valve 32 which is also driven by a second spring, and slides in the bush 31.

[0023] The fixed element 21 is further provided with a cylindrical shutter 33 adapted to isolate the liquid circuit connected to the motor pump 1 so as to prevent the liquid remaining in the latter from flowing outside, this shutter sliding outside the hollow piece 29 and being actuated by a third spring.

[0024] The imperviousness of the assembly is ensured in a known fashion by a series of O-rings 34 resting on seats provided for this purpose.

[0025] The positioning of the various constituent elements provides the object of the invention with a maximum of useful effects which, to date, had not been obtained by similar devices.